BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

In the Matter of	)	
	)	
Revision of the Commission's Rules	)	CC Docket No. 94-102
To Ensure Compatibility with	)	
Enhanced 911 Emergency Calling Systems	)	

To: The Commission, *en banc*

OPPOSITION OF GRAYSON WIRELESS TO HAWAIIAN WIRELESS, INC. PETITION FOR WAIVER

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January 5, 2001

SUMMARY OF POSITION

The Petition for Waiver of the E-911 Phase II implementation schedule filed by Hawaiian Wireless, Inc. (HWI) fundamentally rests upon the generalized assumption that no existing Automatic Location Information (ALI) product is available for its Ericsson modified TDMA cellular system. HWI's lone investigation, according to its petition, consisted of inquiring whether Ericsson itself would supply a Phase II solution to HWI; it has not engaged in any other due diligence inquiry.

In fact, however, the Geometrix™ network overlay system developed by the Grayson Wireless division of Allen Telecom meets or exceeds the Commission's accuracy and capacity requirements for Phase II and fully supports the TDMA air interface employed in HWI's system. The unusual technical features of HWI's network are not imposing obstacles for a network-based caller location system such as Geometrix™; and there is no obvious reason why it would not function successfully on HWI's "down banded" TDMA system with minimal adaptation.

In the *Fourth Memorandum Opinion & Order* the Commission expressly ruled that a broad and generalized waiver of Phase II requirements is not warranted and would not be granted. The Commission further specifically required that any waiver requests document fully that the requesting carrier aggressively exercised due diligence in investigating potential Phase II solutions, and that requesting carriers demonstrate that they come as closely as possible to full compliance. HWI's vague and unsubstantiated petition utterly fails to meet those standards and should be promptly denied.

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HAWAIIAN WIRELESS, INC. PETITION FOR WAIVER

GRAYSON WIRELESS DIVISION of ALLEN TELECOM INC. ("Grayson Wireless"), pursuant to Public Notice DA 00-2704 released December 4, 2000, hereby opposes the Petition For Waiver of Section 20.18 of the Commission's rules (the "Petition") filed in the captioned proceeding by Hawaiian Wireless, Inc. ("HWI") on November 9, 2000. Grayson Wireless respectfully submits that HWI's Petition is insufficiently supported under the standards for grant of a Phase II waiver established by the Commission in the *Fourth Memorandum Opinion and Order* herein.[1] Accordingly, HWI's Petition should be promptly denied.

In opposition to the Petition, Grayson Wireless respectfully shows:

Background

In the *Fourth MO&O* the Commission forcefully reaffirmed its commitment to rapid implementation of Automatic Location Identification (ALI) technology by wireless carriers in order to comply with the mandates of the Wireless Communications and Public Safety Act of 1999, Pub. L. No. 106-81, enacted October 26, 1999. To this end, the Commission maintained its pre-

[1] *Revision of the Commission's Rules To Ensure Compatibility with Enhanced 911 Emergency Calling Systems (Fourth Memorandum Opinion and Order)*, 2000 FCC Lexis 4725 (FCC 2000) (the "*Fourth MO&O*").

viously-established Phase II implementation schedule for carriers choosing a network overlay solution, while making adjustments to the schedule for carriers choosing a handset-based technology. According to the Commission, the adjustments were appropriate in order to accommodate the current state of development of handset-based ALI technology.

The Commission further acknowledged the possibility that waivers of the modified schedule may nonetheless be necessary in limited circumstances; and it established a stringent standard by which any such requests would be evaluated. Applying that standard to the three waiver requests then pending before it, the Commission denied the requests by Sprint and by United States Cellular Corp. as insufficiently supported. On the other hand, the Commission credited the claim by VoiceStream Wireless that ALI technology is not available for the GSM air interface used by it, and thus granted VoiceStream a waiver -- subject to conditions -- to permit it to deploy a hybrid location solution on a modified timetable.

Commissioners Ness and Tristani dissented to the VoiceStream waiver because of their concern that the waiver "invites other carriers to make similar showings" and thus "may have the effect of a rule change" that "in effect, create[s] an alternative Phase II implementation track for carriers inclined to seek new E911 solutions in lieu of prompt deployment under our existing rules." The Commissioners concluded that "Ultimately, we are concerned that in light of today's decision other carriers – whether deploying GSM or other modulation technologies – *may choose to focus on seeking a waiver rather than rapidly implementing E911 consistent with our accuracy and deployment requirements.*" (Emphasis added).

The HWI Waiver Petition

Evidently confirming the predictions of Commissioners Ness and Tristani, HWI submitted its Petition on November 9, 2000, in lieu of an implementation report as contemplated by the

Fourth MO&O. HWI claims that its ESMR system employs a "'one of a kind'" Ericsson cellular network that has been "'down banded'" to operate on 800 MHz SMR spectrum. HWI provides virtually no technical information concerning its system; and the article in *Wireless Week* referenced at p. 5 & n. 9 of its Petition states only, in relevant part, that HWI "uses Ericsson Inc.'s Interim Standard-136 time division multiple access network and dual-mode, dual-band handsets. The handsets allow for nationwide roaming on the 850 MHz cellular analog systems."

IS-136 is the generally accepted standard for Time Division Multiple Access (TDMA); therefore, HWI's use of that technology does not *per se* differentiate it from any other TDMA network. Similarly, dual-mode handsets are handsets that are capable of both TDMA and AMPS operation, which likewise does not differentiate HWI's system from countless other systems in the United States. HWI's dual-band handsets presumably operate on both the 800 MHz SMR and 850 MHz cellular spectrum bands. While this specific frequency combination is indeed unusual, it is not a technologically imposing obstacle for a network-based caller location system such as Grayson Wireless' Geometrix™ system.

Nonetheless, HWI insists that "the technology required to come into compliance with the Commission's Phase II E-911 rules by October 1, 2001, is not currently and is not expected to become available to HWI" and that "it is technically and economically infeasible for [HWI] to comply with the implementation schedule for Phase II E-911". (Petition at p. 2). Tacitly acknowledging that its investigation was confined solely to inquiries posed to Ericsson, HWI infers from Ericsson's refusal to provide a Phase II E-911 solution that HWI's sole compliance option "would be to replace [HWI's] entire system, both infrastructure and subscriber units, using more broadly available technology such as AMPS, TDMA [sic.], CDMA or even GSM." (*Id.* at p. 6). HWI contends that compliance would be financially "ruinous" and "entirely disruptive of HWI's

subscriber base", as well as "particularly wasteful" because HWI has not yet received a PSAP request for E-911 capabilities. (*Id.* at p. 7).

Interest of Grayson Wireless

As the record in this proceeding already reflects, Grayson Wireless has invested significant time and expense in developing its Geometrix™ wireless location system.[2] Geometrix™ is a comprehensive ALI product, including hardware, services and support, which fully satisfies the Commission's existing E-911 Phase II accuracy and capacity requirements for network-based solutions, and which supports AMPS, TDMA (IS-136), CDMA (IS-95) and iDEN systems. Grayson Wireless has aggressively advertised and promoted the availability of Geometrix™ in trade publications, at trade shows and on its web site http://www.geometrix911.com since the first quarter of 2000.[3] Additionally, representatives of Grayson Wireless have participated in numerous industry conferences and seminars, repeatedly sat for interviews by major trade publications and published numerous articles concerning the availability and capabilities of Geometrix™.

The general availability of Geometrix™ was announced on January 17, 2000; a live, multi-protocol demonstration of the product was conducted at CTIA's "Wireless 2000" trade show on February 28, 2000; and, more recently, multiple field trials of Geometrix™ have been successfully completed with Verizon Wireless in Lexington, Kentucky and in the Northern Virginia suburbs of Washington, DC. Field trials with AT&T Wireless also have been completed in the Seattle, Washington area, and are continuing in Denver, Colorado. Geometrix™ has entered

[2] *See, e.g.*, Grayson Wireless, a division of Allen Telecom Inc., June 8, 2000, *Ex Parte* Comments (E-911 Phase II Readiness Update); *Ex Parte* letter dated September 15, 2000; *Ex Parte* submission dated September 27, 2000; Comments of Allen Telecom Inc. in Support of Petition for Reconsideration of VoiceStream Waiver, dated October 10, 2000.

[3] Attached as Exhibit A is a specimen advertisement for Geometrix™ representative of advertisements placed in trade publications beginning the first quarter of 2000; and attached as Exhibit B are excerpts from the Geometrix™ web site providing information to interested parties concerning the capabilities and availability of Geometrix™.

into commercial production in anticipation of carrier demand in 2001 to meet the Commission's E-911 Phase II compliance requirements; and Grayson Wireless is prepared to meet that demand.

Of particular significance herein is the fact that Geometrix™ supports the TDMA (IS-136) air interface utilized by HWI's network infrastructure, in addition to other common air interfaces used by other carriers. HWI's Petition is virtually devoid of any technical information, but there is no obvious reason to believe that a network overlay solution such as Geometrix™ would not function successfully on HWI's "down banded" TDMA system with minimal adaptation. Equally important, there is no indication whatsoever that HWI has ever investigated possible vendors for Phase II other than Ericsson; and, so far as Grayson Wireless has been able to determine, HWI has never contacted Grayson Wireless to investigate the capabilities of Geometrix™ to meet HWI's Phase II requirements.

HWI Has Wholly Failed to Justify Grant of a Phase II Waiver

In the *Fourth MO&O* the Commission addressed at length the standard it would employ in evaluating requests for waivers of the Phase II rules.

> In the case of E911, we have recognized that there could be instances where technology-related issues or exceptional circumstances may mean that deployment of Phase II may not be possible by October 1, 2001, and indicated that these cases could be dealt with through individual waivers as these implementation issues are more precisely identified.*
>
> . . . ALI technologies are already, or will soon be, available that provide a reasonable prospect for carriers to comply with the E911 Phase II requirements. Waivers thus should not generally be warranted, especially in light of the vital public safety benefits of Phase II. *In those particular cases where waivers may be justified, however, broad generalized waivers should not be necessary and will not be granted. Rather, we expect waiver requests to be specific, focused and limited in scope, and with a clear path to full compliance. Further, carriers should undertake concrete steps necessary to come as close as possible to full compliance* (*e.g.*, selecting ALI technologies or vendors, timely placing orders for necessary equipment, performing other necessary preparatory work) and should document their efforts aimed at compliance in support of any waiver requests. Carriers seeking a waiver will be expected to specify the solutions they considered and ex-

> plain why none could be employed in a way that complies with the Phase II rules. If deployment is scheduled but for some reason must be delayed, the carrier should specify the reason for the delay and provide a revised schedule.
>
> . . . *We expect wireless carriers to work aggressively with technology vendors and equipment suppliers to implement Phase II, and to achieve full compliance as soon as possible*.* Carriers should not expect to defer providing a location solution if one is available and feasible. If a carrier's preferred location solution is not available or will not fully satisfy the rules, in terms of accuracy and reliability or timing, the carrier would be expected to implement another solution that does comply with the rules. Further, if no solution is available that fully complies, the carrier would be expected to employ a solution that comes as close as possible, in terms of providing reasonably accurate location information as quickly as possible. *It is not sufficient for a carrier to undertake a minimalist approach, in which the carrier conducts certain tests, decides that the tests do not definitively demonstrate that the technologies tested will satisfy the Commission's requirements in all situations, and as a result, declines to implement any ALI solution.*

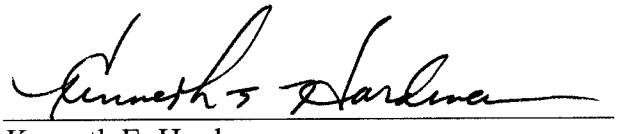
Fourth MO&O at ¶¶43-45. (Emphasis added). (*Footnote omitted).

HWI's Petition thus is expressly foreclosed by the standard established in the *Fourth MO&O*. HWI's "investigation" of available technologies has been virtually nonexistent and does not even rise to the "minimalist" approach the Commission ruled is insufficient. Moreover, HWI's Petition is broad and generalized, which the Commission expressly stated "will not be granted," rather than "specific, focused and limited in scope, and [showing] a clear path to compliance". Under these circumstances HWI has plainly failed to meet the heavy burden assigned

by the Commission to carriers seeking a waiver of the Phase II requirements. Accordingly, HWI's Petition For Waiver should be promptly denied.

Respectfully submitted,

GRAYSON WIRELESS DIVISION
of ALLEN TELECOM INC.

By: 
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January 5, 2001

A T T A C H M E N T A

(Specimen Geometrix™ Advertisement)

GEOMETRIX™ WIRELESS LOCATION SOLUTION

E911 PRIME LOCATIONS

- FCC Compliant
- Carrier Tested
- In-House Manufacturing
- Cellular and PCS
- Simple and Efficient
- Carrier Controlled
- Supports Enhanced Services

NOW AVAILABLE

Ready for the Real World: Compact, easily deployable, integrated location system. Commercial production 4Q 2000. Supports all major air-interfaces and frequencies in all calling environments.

Allen Telecom's Geometrix™ E911 Wireless Location Solution • network overlay system • meets or exceeds FCC Phase II requirements • easily interfaces with Phase I systems • accurate TDOA or TDOA/AOA measurements • supports AMPS, TDMA (IS-136), CDMA (IS-95), and iDEN systems individually or simultaneously without duplicated equipment • customer and CPNI privacy • world's leading provider of wireless telecommunications equipment • in-house ISO 9001 certified manufacturing • scalable • turnkey system • **Available Now!**

visit www.geometrix911.com or contact us at 1-877-GEO-E911

ALLEN TELECOM ®

A T T A C H M E N T B

(Excerpts From http://www.geometrix911.com/ Web Site)

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Geometrix®

Geometrix is a high-performance, cost effective **Wireless E911 Solution** offered by the Grayson Wireless division of Allen Telecom Inc. (A/T). Geometrix is a comprehensive product, which includes hardware, services and support for successful deployment and operation. **The Geometrix Solution** includes the Locating Equipment, Planning Tools, Manufacturing Capabilities and Life Cycle Support**.**

- **Geometrix** is a network-based location system, which performs well in all environments (urban, suburban and rural). It meets the accuracy and capacity requirements of E911 and other location-based services.
- **Geometrix** solution exceeds all FCC performance requirements.
- **Geometrix** planning tools can accurately predict your location network needs by using a combination of propagation models, terrain and morphology data and location algorithms.
- **Geometrix** hardware is manufactured by Grayson Wireless, a division of Allen Telecom, in its ISO-9001 certified plant in Lynchburg, VA.
- **Geometrix** is provided by A/T, a long standing provider of equipment and services with a reputation for quality and reliability.

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Geometrix® Advantages

Seamless Integration Into Current Operations

Geometrix integrates and operates transparently. Your wireless customers will not experience any change in service.

Geometrix supports networks using multiple technologies such as CDMA/AMPS, and transitions seamlessly through network technology transitions.

Geometrix is an unobtrusive E911 solution. It requires no modification or replacement of customer handsets, no additional handset functions, and no end user instructions.

Meets all FCC Requirements

Geometrix exceeds all Federal Communications Commission performance requirements. A/T has the production resources to meet the FCC implementation timeline.

Manufacturing Capabilities

Allen Telecom Inc. is a leading supplier of wireless equipment to the global telecommunications infrastructure market. A/T's eight divisions produce a broad line of wireless infrastructure products from their eleven ISO 9001 certified manufacturing facilities. A/T's Grayson Wireless division produces the Geometrix product line in its Lynchburg, Virginia manufacturing facility. A/T's other divisions also offer network performance products, base station and mobile antennas, filters, combiners, repeaters, amplifiers, duplexers, fiber optic in-building coverage systems and RF engineering solutions to carriers, operators and OEM's in the wireless telecommunications industry.

Company Strength

Allen Telecom Inc. combines over 100 years of wireless

engineering experience with the broadest, most technically advanced product line in the wireless telecommunications equipment industry. More than 2,000 employees have contributed to the growth of the company's eight divisions and are responsible for well over 200 patents and trademarks. In 1998, sales topped $388 million and the company enjoyed a net worth in excess of $250 million. Allen Telecom (ALN), listed on the New York Stock Exchange since 1971, is firmly committed to the public safety and other applications of geolocation systems in response to consumer needs.

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Wireless E911 Solution: Geometrix®

Geometrix is the basis for A/T's Wireless Location Solution. Equipment from this product line resides in the carrier's network at base station and MSC locations. The equipment supports AMPS, TDMA (IS-136), CDMA (IS-95), iDEN and dual mode networks. Geometrix fills the needs of the wireless carrier who desires to purchase and operate a location network, or it can be configured as a remotely monitored and controlled system in a service bureau model. Geometrix can also be shared among multiple wireless service providers.

Architecture

The Geometrix Wireless Location Solution is based on a network overlay model. As depicted in the graphic below, Geometrix Wireless Location Sensors (WLS), located at the wireless base stations (BTS), and under control from a central location processor measure features of wireless handsets' radio signals. The WLS units transmit these measurements to the Geolocation Control System (GCS) where the location of the handset is determined and communicated to end user applications.

The Geolocation Control System (GCS) is the Geometrix central location processor. In addition to performing the location determination, the GCS manages, coordinates, and administers the WLS network. Geometrix typically connects to Public Safety Answering Points through existing E911 Phase I support systems.

An external data link to the GCS provides a gateway for the Geometrix maintenance network. The maintenance network provides 24-hour, 7-day total system monitoring, transparent software upgrades, system backup, configuration modifications, and an interface for remote troubleshooting and repair. A custom version of the maintenance interface can connect to existing OA&M systems.

Upgradability

The Geometrix network overlay offers maximum flexibility in scaleable deployment. A carrier may choose to initially deploy Geometrix in those areas with the highest cellular density. Additional WLS units may be added to expand the coverage area as required. The Geometrix system has been designed in a scaleable and upgradeable fashion. The system may be upgraded to accept future air-interfaces, increase coverage, or increase capacity with maximal re-use of existing hardware. In its basic configuration, a typical Geometrix network is capable of providing hundreds of geolocations per second, well in excess of anticipated E911 loadings. As with other aspects of the equipment, capacity can be increased through field installable hardware modules.

Technology

Using proven location techniques of Time Difference of Arrival (TDOA) and Angle of Arrival (AOA), Geometrix provides highly accurate position estimates in a variety of signal environments. Geometrix efficiently provides the desired location accuracy for each type of coverage area by utilizing the combination of location techniques and WLS configurations most appropriate to the area.

Time Difference of Arrival (TDOA)

3-Site TDOA Location

The TDOA technique works by measuring the exact time of arrival of a handset radio signal at three or more separate cell sites. Because radio waves travel at a fixed and known rate (the speed of light), by calculating the difference in arrival time at pairs of cell sites, it is possible to calculate hyperbolas on which the transmitting device is located. As seen in the figure, measurements at two pairs of cell sites (e.g. sites 1 & 2, and sites 1 & 3) create two intersecting hyperbolas indicating the location of the transmitting device. The TDOA technique typically uses existing receive antennas already present at a cell site.

Angle of Arrival (AOA)

Angle of Arrival

The AOA technique determines the direction of arrival of a handset's signal at the cell site. The phase difference of the signal on elements of a calibrated antenna array mounted at the cell site provides the angle of arrival. The intersection of the angles from two or more sites provides the location. The AOA technique determines the direction of arrival of a handset's signal at the cell site. The phase difference of the signal on elements of a calibrated antenna array mounted at the cell site provides the angle of arrival. The intersection of the angles from two or more sites provides the location.

Geometrix TDOA + AOA

Combination of TDOA & AOA

In most applications, Geometrix meets performance requirements using only TDOA sensors. In certain circumstances TDOA sensors are augmented with AOA capability to improve coverage and accuracy. One example of this is the coverage of a rural highway where the cell site arrangement often is in a line along the highway. TDOA-only systems must overcome increased propagation loss for three-site reception. The geometry of the cell site placement challenges both TDOA-only and AOA-only systems. However, a combination of these techniques in Geometrix produces an accurate position calculation from only two sites.

Capabilities

The Geometrix system offers a wide range of configuration options to cost-effectively meet the challenge of providing the required location accuracy in the presence of signal multipath interference and challenging tower placement geometry. Installations can be selected for individual sites from the lowest cost TDOA-only version to the highest performance AOA + TDOA combination. The Geometrix system operates with the optimum mix of sensor types to produce the required accuracy at the lowest overall cost.

Basic Configuration

Using A/T's system planning software, the Geometrix configuration is designed to meet the FCC E911 Phase II accuracy requirements. Our experience shows that a two-

antenna TDOA system can deliver the required accuracy in a major percentage of typical applications. In areas where the location accuracy is affected by high multipath or disadvantaged cell site geometry, Geometrix can employ a variety of techniques to overcome performance challenges.

Multipath

In all applications, Geometrix uses proprietary blind spatial processing algorithms to mitigate multipath and co-channel induced errors. In very high multipath environments, however, these techniques may be augmented by using measurements from four antennas. By taking measurements from four antennas, Geometrix is able to recognize multipath components through spatial processing algorithms, and mitigate their effect on accuracy.

Rural Environments

The other major challenge for a network overlay system is to function well in a rural environment where cell sites are far apart and "hearability" is not always possible from three sites. In this case, Geometrix augments its TDOA approach with AOA. The combination of TDOA and AOA with spatial processing offers the capability to provide accurate locations in such demanding environments. The TDOA + AOA combination can provide the measurements necessary for a location calculation with the desired confidence factor from as few as two sites.

The antennas necessary to measure AOA can be manufactured to be unobtrusive and non-disruptive to existing sites. Through proprietary techniques, the necessary multi-element spacing can be provided in a physical package very similar to currently deployed antennas. Through the well-established capabilities of A/T's Decibel Products Division, these antennas provide the necessary capabilities for location with minimal effect on the operation of the site and effort with respect to leases and zoning considerations.

Applications Support

All Geometrix configurations locate mobile stations by making measurements on the voice/traffic channel slots. This approach allows multiple geolocations to be performed on a mobile station. Rapidly repeated locations allow verification of position, while periodic locations over time allow mobile stations to be tracked. This feature provides the basis for many of the revenue generating location services contemplated for the future.

Geometrix WLS units have been designed with the functionality

and capacity necessary to provide full compliance with the FCC's E911 Phase II requirements. This level of accuracy is sufficient for many other location-based services. However, Geometrix has built into the WLS the necessary upgrade paths to deliver greater accuracy and higher capacity should they be required. The decision as to when to invest in additional location based capabilities to support enhanced services is left with the individual carrier. Only when competition or customers demand these location-based services, it is necessary to invest in the facilities to offer enhanced location-based services only when the carrier's business objectives deem them prudent.

Protocols Supported

The Geometrix products support: AMPS, TDMA (IS-136), CDMA (IS-95), TDMA/AMPS, CDMA/AMPS and iDEN systems in the 800 MHz band and TDMA (IS-136) and CDMA (J-STD-008) in the 1900 MHz band.

Supports Dual Mode Networks

Operation in dual mode networks is supported in Geometrix with no additional equipment at cell sites. A WLS locates analog and digital calls through software based receivers. Geometrix seamlessly provides location on a call which transitions between analog and digital as the call progresses.

Applications Interface

The Geometrix GCS supports industry standard Phase I interfaces. Currently this includes the position determining equipment (PDE) interfaces supported by XYPOINT and SignalSoft. In addition, A/T strongly supports the efforts of the Telephone Industry Association Committee TR45.2 Ad hoc on Emergency Services. This committee is responsible for the development of an industry standard interface between position determination equipment, the wireless network, and the Public Safety Answering Point (PSAP). We believe that this standards development process affords all participants the opportunity to contribute to the developing standard while simultaneously producing an open interface which, if widely supported by wireless carriers, serves to lower implementation costs for Phase II technologies.

In the approaches being developed by the industry standards organizations, the PDE is functionally viewed by the wireless network as a black box. By shielding the wireless network and Phase I solution from the location processing and PDE intra-system messaging, the messaging between the wireless network and the PDE is greatly simplified.

Installation, Operation and Maintenance

The design philosophy behind Geometrix dictates a product that:

- Is easy to install and implement
- Causes minimal impact to the wireless network and its customers
- Is highly reliable with no periodic maintenance
- Automatically detects and isolates faults
- Corrects malfunctions or provides maintenance alarms
- Consists of ruggedized line replaceable units

Physical Attributes

A WLS unit occupies less than one cubic foot of space (19"w x 3.5"h x 18"d). Configurations are available for a variety of environmental and mounting options depending on the requirements of the base station. In the case of a base station in a shelter, the WLS typically is rack-mounted along with the other cell site equipment. For outdoor base stations, the WLS mounts in a weatherproof container. In either case, the WLS operates from standard dc power sources typically found at cell sites. The WLS dissipates less than 200 watts.

Installation

The entire installation and implementation process for Geometrix has been designed to be fast and easy, and to seamlessly integrate Geometrix with wireless networks. At the base station, the WLS connects to a spare port on the multicoupler and requires only one DS0 equivalent to communicate with the GCS. In locations where the WLS is configured for two-antenna TDOA, no antenna modifications are necessary. In locations configured for four-antenna TDOA, Geometrix generally uses antennas from adjacent cell sectors. Again, no antenna modifications are necessary. Finally, in the case where the TDOA is augmented by AOA, either an additional antenna is mounted, or one of the receive antennas in the cell sector is replaced. In order to simplify this, A/T offers an antenna by Decibel Antennas in which the necessary multi-element spacing is provided in a physical package very similar to the already deployed antennas. The advantage of this approach is an antenna that will have minimal, if any, impact with respect to leases and zoning considerations.

The Geolocation Control System (GCS) is based on commercial computer equipment configured for rack mounting and operation in a typical MSC environment. The GCS is capable of supporting all standard network interfaces for interconnection to wireless networks and to external communications facilities.

Operations, Administration, & Maintenance

The Geometrix system provides internal system monitoring as well as external alarm reporting. The GCS routinely polls the status of all WLS units in the network. If a fault or failure is detected, the GCS can reboot and restart the WLS. If a major fault (e.g. over temperature) is detected, the WLS has a dry contact relay interface available to the base station alarm system.

The GCS is a high availability, fault tolerant server. The GCS self-monitors its internal processes and can restart any or all if necessary. It has redundant hardware functioning in hot standby that in event of failure will resume any or all processing. Status, statistics, and alarm conditions are all logged on the GCS.

A support network constantly monitors all Geometrix systems. This network can be integrated into in-place operation and maintenance (O&M) functions, or can be operated by A/T in a service bureau mode. In the service bureau model, the support center connects to each GCS and monitors every aspect in the system. The network support center provides 24-hour 7-day monitoring of all systems. This center also provides system maintenance functions such as routine backup, software upgrades, and configuration changes. The Geometrix Network operates autonomously from the support network. The support network serves as an oversight and monitoring function, but does not participate in the real time operations involved in position determination.

Field Trials and Private Network

The Geometrix System has been extensively tested in field trials and is available for observation operating in a private network located in Northern Virginia. The private network has five sites, covering an area of approximately 18 square miles. Through extensive data gathering under real-world conditions, the Geometrix technology has proved it will meet and surpass the FCC requirements.

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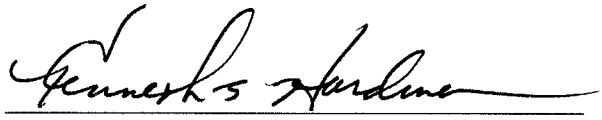
CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing Opposition of Grayson Wireless to Hawaiian Wireless, Inc. Petition for Waiver and annexed attachments upon Hawaiian Wireless, Inc. by mailing a true copy thereof, first class postage prepaid, to its attorneys, Elizabeth R. Sachs, Esquire, Marilyn S. Mense, Esquire, and B. Lynn F. Ratnavale, Esquire, Lukas, Nace, Gutierrez & Sachs, Chartered, 1111 – 19th Street, N.W., Suite 1200, Washington, DC 20036.

Dated at Washington, DC this 5th day of January, 2001.



Kenneth E. Hardman